

CLAIMS

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B1  
1. A rigid polyurethane foam comprising a foamed structure consisting of closed cells substantially free therein of optionally halogenated hydrocarbon foaming agents, said foam having an adhesion strength to a supporting substrate, measured according to standards EN 1607, equal to or higher than 0.7 kg/cm<sup>2</sup>.

2. The polyurethane foam according to claim 1, having a percent linear dimensional variation, measured according to standards EN 1604, from a minimum temperature of -25°C to a maximum temperature of 70°C, not higher than 4%.

3. The polyurethane foam according to claim 1, having a friability, measured as percent weight loss according to standards ASTM C421, not higher than 3%.

4. The polyurethane foam according to claim 1, having a heat conductivity, measured according to standards ISO 6902, of from 0.024 to 0.028 W/m°C.

5. The polyurethane foam according to claim 1, obtained by submitting to reaction and simultaneous foaming a mixture of ingredients comprising per 100 parts by weight thereof:

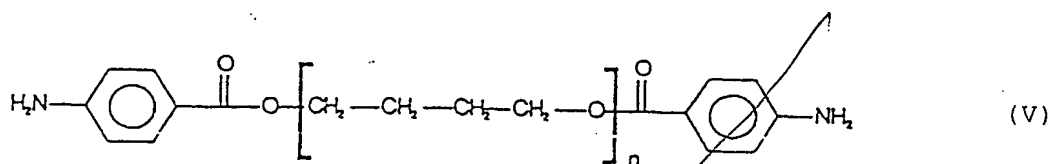
- from 10 to 25 parts of at least one polyester polyol having a minimum functionality equal to 2 and a hydroxyl number of from 250 to 600;

- from 50 to 65 parts of at least one isocyanate compound;

- from 1 to 2 parts of a water-based foaming agent;

- from 0.3 to 2 parts of a suitable surfactant adapted to allow the mutual miscibility between said at least one polyol and said isocyanate compound.

6. The polyurethane foam according to claim 5, wherein said mixture of ingredients further comprises 0.1 to 4 parts by weight of a polyamine having the formula



wherein n is an integer of from 1 to 20.

7. The polyurethane foam according to claim 5, wherein said  
5 mixture of ingredients further comprises from 3 to 20 parts  
of at least one polyether polyol having a minimum  
functionality equal to 2 and a hydroxyl number of from 150  
to 550.

8. The polyurethane foam according to claim 5, wherein said  
10 mixture of ingredients further comprises from 5 to 10 parts  
of at least one halogenated or phosphorated polyol having a  
minimum functionality equal to 2 and a hydroxyl number of  
from 240 to 300.

9. The polyurethane foam according to claim 5, wherein said  
15 mixture of ingredients further comprises from 4 to 10 parts  
of a suitable flame retardant agent.

10. The polyurethane foam according to claim 5, wherein  
said mixture of ingredients further comprises from 0 to 3  
parts of a catalyst selected from the group consisting of:  
20 foaming, polymerization and trimerization catalysts.

11. A heat insulating building element comprising at least  
one supporting substrate coupled to a rigid polyurethane  
foam according to claim 1.

12. The building element according to claim 11, comprising  
25 a composite structure substantially of the sandwich type,  
including a couple of supporting substrates between which  
said rigid polyurethane foam is interposed.

13. The building element according to claim 11, wherein  
said supporting substrate is selected from the group  
30 consisting of: rigid or flexible sheets made of metal,

concrete layers, bricks, wood panels, plasterboard, and the like.

14. The building element according to claim 11, further comprising a protective film applied on the rigid polyurethane foam on a side thereof opposite to the supporting substrate.

15. The building element according to claim 12, in the form of a modular wall for manufacturing ducts for conditioning plants.

10 16. A process for producing a heat insulating building element, comprising at least one supporting substrate in the form of a plate, a sheet or a panel coupled to a rigid polyurethane foam, comprising the steps of:

15 a) providing a supporting substrate in the form of plate, sheet or panel;

b) feeding on said supporting substrate a dosed amount of a mixture of ingredients according to claim 5;

20 c) submitting to cross-linking and simultaneous foaming said mixture of ingredients, so as to obtain a rigid polyurethane foam coupled to said substrate.

17. The process according to claim 16, further comprising the step of applying on said rigid polyurethane foam a protective film on a side thereof opposite to the supporting substrate.

25 18. The process according to claim 16, further comprising the step of applying on said supporting substrate a primer before carrying out said feeding step.

30 19. The process according to claim 16, further comprising the step of coupling during said step c) a coating substrate to the rigid polyurethane foam being formed, obtaining a building element comprising a composite structure substantially of the sandwich type.

20. The process according to claim 16, wherein said steps a) - c) are carried out in continuous.

21. A process for the batch production of a heat insulating building element, comprising a composite structure substantially of the sandwich type, including a couple of supporting substrates between which a rigid polyurethane foam is interposed, comprising the steps of:

a) providing in a forming apparatus and in mutually spaced relationship a couple of supporting substrates in the form of plate, sheet or panel,

b) feeding in said forming apparatus and between said couple of substrates a dosed amount of a mixture of ingredients according to claim 5;

c) submitting to cross-linking and simultaneous foaming said mixture of ingredients, so as to obtain a rigid polyurethane foam interposed between said couple of substrates.

22. The process according to claim 21, further comprising the step of applying on at least one substrate of said couple a primer before carrying out said step b).

23. A process for producing a heat insulating building element, comprising at least one supporting substrate coupled to a rigid polyurethane foam, comprising the steps of:

a) spraying on said supporting substrate a dosed amount of a mixture of ingredients according to claim 5;

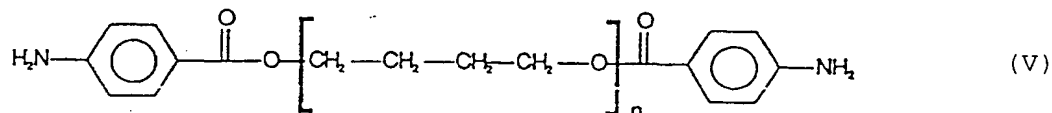
b) submitting to cross-linking and simultaneous foaming said mixture of ingredients, so as to obtain a rigid polyurethane foam coupled to said substrate.

24. The process according to claim 23, further comprising the step of applying on said rigid polyurethane foam a protective film on a side thereof opposite to the

supporting substrate.

25. The process according to claim 23, further comprising the step of applying on said supporting substrate a primer before carrying out said spraying step.

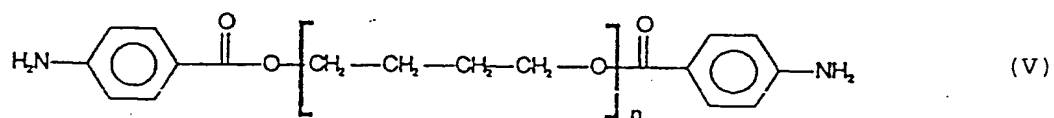
- 5 26. A method for promoting the properties of adhesion to a supporting substrate of a polyurethane foam obtained by submitting to reaction and simultaneous foaming a mixture of ingredients comprising at least one polyol with at least one isocyanate compound in the presence of a water-based  
10 foaming agent, comprising the step of providing in said mixture a polyamine having the formula



wherein n is an integer of from 1 to 20.

- 15 27. A liquid catalytic composition for producing a rigid polyurethane foam comprising:

- at least one liquid carrier selected from the group consisting of: polyester polyols, polyether polyols, halogenated or phosphorated polyols, flame retardant agents, and mixtures thereof, said liquid carrier having a  
20 viscosity of from 10 to 300 mPa\*s at 25°C;
- a polyamine having the formula



wherein n is an integer of from 1 to 20, and

- 25 - at least one catalyst selected from the group consisting of: foaming, polymerization and trimerization catalysts.